



A Framework for  
Transportation  
Electrification  
in Illinois



# Guiding Principles for Beneficial Electrification of Transportation



Elizabeth A. Kócs, PhD  
UIC Energy Initiative, January 2021



**Energy  
Initiative**

## ABOUT THE AUTHOR



As UIC Energy Initiative's Director of Partnerships & Strategy, Dr. Kócs brings together like-minded individuals in institutions and industry at all levels -- local, regional, national and international.

A master collaborator, she forges unique opportunities for program development, strategic planning, and applied research, strengthening the UIC Energy Initiative and leading efforts toward a sustainable energy future.

Dr. Kócs has published in a number of research journals including publications in energy, architectural and environmental research. Her scholarly work covers energy, sustainability and environment-behavior perspectives, transportation electrification, mobility, energy storage, and urban sustainability.

## ABOUT UIC ENERGY INITIATIVE

The University of Illinois-Chicago (UIC) Energy Initiative focuses on energy, sustainability and technologies to support sustainable and resilient transportation and electricity systems. The role of the UIC Energy Initiative is to develop and cultivate initiatives in energy, mobility, and urban sustainability across local, regional, national and international ecosystems. Through our partnerships and strategic direction, the UIC Energy Initiative builds and fosters collaborative approaches that leverage and advance expertise, tools and resources to address climate challenges.

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## EXECUTIVE SUMMARY

Illinois' transportation sector is responsible for approximately one-third of all carbon emissions. Any state-level climate action plan should include electrification as a strategy for decreasing transportation emissions. Working groups in the [\*UIC Workshops on Beneficial Electrification of Transportation\*](#) believe it is imperative for the State of Illinois to develop and deliver a plan for transportation electrification in our state.

Supporting and incentivizing electric vehicles (EVs) will not only remove a large number of carbon emitting vehicles from Illinois' roads, but it will also have immediate air quality benefits, in particular for disadvantaged Black, Indigenous and People of Color (BIPOC) communities, which continue to be negatively impacted by pollution.

Encouraging the electrification of transportation ties into other EV initiatives—[\*Putting Consumers & Climate First: \[Illinois\] Governor Pritzker's Eight Principles for a Clean & Renewable Illinois Economy\*](#), local and state level planning committees, and Chicago Area Clean Cities, among others. Additionally, funds from the [\*Volkswagen Settlement\*](#)<sup>1</sup> and a 2019 [\*Illinois capital plan-infrastructure initiative\*](#) are already available to the state to support transportation electrification.<sup>2</sup>







In August, 2020, for example, “[the ICC opened a Notice of Inquiry \(NOI\)](#) to explore electricity rate design options related to the adoption and deployment of all types of electric vehicles and supporting transportation electrification infrastructure such as charging stations.” The impact of rate design was another aspect of their inquiry. Initial comments on the NOI were due in November, with replies due by December 18, 2020.<sup>3</sup>

*“Supporting and incentivizing electric vehicles (EVs) will not only remove a large number of carbon emitting vehicles from Illinois’ roads, but it will also have immediate air quality benefits, in particular for disadvantaged Black, Indigenous and People of Color (BIPOC) communities, which continue to be negatively impacted by pollution.”*

At the national level, the [Multi-State Medium- and Heavy-Duty Zero-Emission Vehicle Memorandum of Understanding \(MOU\)](#), signed by 15 states and Washington D.C. on July 14, 2020, calls for only new medium- and heavy-duty zero-emission trucks and buses to be sold in their jurisdiction by 2050, with a 30% goal of zero emission commercial vehicles by 2030. If Illinois signs on, it can accelerate a clean truck rule.

More recently, at the federal level, President-elect Joe Biden—together with leaders of Clean Energy for Biden—has outlined [policy recommendations for clean energy](#) with the goal of a 100% carbon-neutral economy by 2050. The recommendations for reducing greenhouse gas emissions from transportation include objectives for accelerating clean transportation infrastructure through policy and funding, strengthening auto emissions standards, applying Zero-Emission Vehicle (ZEV) standards nationally, and providing stimulus for electric transit buses, among other aims.





With initiatives like these, and with state agencies and stakeholders working together, a Transportation Electrification (TE) Plan would only help advance transportation electrification goals. A TE Plan can: 1) decrease consumer energy costs, 2) promote equity and 3) provide direct benefit to already overburdened BIPOC and other communities with air quality concerns. A state TE Plan can extend multiple benefits for Illinois commuters and consumers, and provide state-wide gains for the environment, grid infrastructure, air quality, economy, and health of all Illinoisans.

***A Transportation Electrification Plan can do all these things, but to really address the challenges in front of us in the next 10 years, we must go beyond expectations.***

All the stakeholders recognize the urgency of the climate and local air pollution problems and urge immediate and bold action to reduce emissions from the transportation sector across all vehicle types. Our stakeholders believe that numerical goals, although aspirational, are important to motivate all actors in the electric vehicle (EV) ecosystem and provide guidance to Illinois state agencies in their actions. While Governor Pritzker proposed a goal of 750,000 EVs on the road by 2030, most stakeholders in the Governor's working group process have advocated for higher goals and targets, ranging from 1 million to 2.5 million. Our stakeholders agreed with the need for bold and ambitious goals as well and suggested that 1.5 million by 2030 would be a bold but achievable number.

The [State of California](#) has taken an aggressive approach to transportation electrification, and clean transportation is advancing in the state. With a goal of five million zero-emission vehicles (ZEV) by 2030, they've aimed high.<sup>4</sup> The State of Illinois should follow suit.





**More specifically, an Illinois Transportation Electrification Plan should take action to:**

➤ **Coordinate across regions.**

Governor Pritzker has advocated for regional coordination, and a number of initiatives are underway including low-carbon fuel standards (LCFS) for midwestern states, collaborative corridor charging and transformative solutions by the Great Plains Institute.

➤ **Launch a stakeholder engagement process.**

That reaches communities and corporations alike, EV and non-EV owners, auto manufacturers, retail centers, BIPOC communities, single and multi-unit residential areas, and more. Enlist UIC, a national lab or a consultant to run the process. Listen to what communities want and what they say is working.

➤ **Employ best practices.**

That allow stakeholders to focus on their strengths (i.e., utilities do bottom up planning, feeder by feeder. They understand the distribution grid—where the slack is, where it's tight, where they may have to upgrade—so let them develop a solid plan. Other stakeholders can do the same in their areas of expertise.)

➤ **Maintain clear vision for regulatory issues.**

Streamline processes, offer clear guidance, plan for appropriate rate designs, keep policies consistent, simplify EV purchasing, and more.

➤ **Offer incentives for new and used EVs.**

For low and moderate income residents, BIPOC communities and other diverse communities, and equitably distribute EV charging infrastructure.

➤ **Provide opportunities for equal access.**

To shared EVs and electric last-mile commute programs.

➤ **Leverage clean electricity.**

For EV charging, incentivizing off-peak EV charging.

➤ **Encourage electrification of fleets.**

This is especially impactful when it comes to fleets used for ridesharing and/or delivery based on their ability to increase travel and/or services delivered by zero-emission miles.





## Stakeholders Poised To Address EV Adoption Barriers for Illinois Residents

The *UIC Workshops on Beneficial Electrification of Transportation*—held in February, May/June, and August, 2020—addressed the issues and challenges surrounding electric vehicle adoption and deployment in Illinois. The workshops continued a conversation started on January 8, 2020, when the Illinois Commerce Commission (ICC) held a policy session entitled EVs: The Beneficial Electrification of Transportation.

Overwhelming interest in the session showed in the hundreds of attendees who filled the room and hallways beyond.

Many experts spoke at the policy session, including Dr. Elizabeth Kócs, NREL Executive Energy Leader 2019 and Director of Partnerships & Strategy at UIC Energy Initiative, who presented on Planning for EV's: A Framework.

Dr. Kócs has focused significant effort on clean transportation in recent years, and it was fitting for the university and Dr. Kócs to take the lead in continuing this dialogue.

They did so by inviting relevant stakeholders to participate in a series of workshops, launching a collaborative effort toward developing guiding principles for transportation electrification in the State of Illinois.

To reach as many groups in Illinois as possible, the workshops were available and open to all interested parties through overflow rooms at the Discovery Partners Institute (DPI) (when in person), conference lines, livestreams or webinars through UIC Energy Initiative social media and webinar channels, and recordings of virtual sessions.

As many as 70-180 number of participants gathered for each panel session for the workshops and 12-30 participants engaged in each of the breakout sessions, with a total attendance of more than 750 participants overall. Like those who attended the initial ICC policy session that started the conversation in early 2020, those in attendance at the workshops represented the EV and vehicle manufacturing industries; nonprofits and NGOs; academic and research organizations; utilities and more.



**Our conclusions are that our path forward must involve:**

1. Getting more cars on the road with policies such as Zero-Emission Vehicles (ZEV), rebates, tax credits and incentives for fleets.
2. Addressing high demand charges for certain use cases with rate reform.
3. Using the money that's already allocated for transportation electrification.
4. Putting an Electric Fuels Standard in place.

***What follows is a summary of the guiding questions used for our discussion in the breakout sessions, details of four use cases — the facts, obstacles, opportunities, and key points for each — as well as guidelines emerging from the workshops.***

## SUMMARY OF GUIDING QUESTIONS

Answers can only be as good as the questions, and when our stakeholders came together, we wanted the questions to get to the heart of the issues surrounding *program design, policy design, and the overall economics of EV Charging infrastructure*. We broke the questions into three main categories—economic considerations, roles for stakeholders, and public policy—and then designed the questions:

### ➤ **Economic Considerations**

What are some traits of well-designed economic best practices for transportation electrification and EV Charging Infrastructure? (i.e., business models, economic development opportunities, tariff and rate designs, etc.)

### ➤ **Roles for Utilities, Private Sector & Customers / Best Practices**

What are some themes/ traits of well-designed utility programs and programs on deploying EV Charging Infrastructure? (i.e., best practices, innovative regulatory approaches, who should invest in / own it, what form those investments should be, what are appropriate rate structures, what to do & what NOT to do, considerations for designing for Illinois, etc.)

### ➤ **Public Policy**

What are some characteristics of sustainable best practices for public policy promoting and supporting transportation electrification and for deploying EV Charging Infrastructure? (i.e., leading advocates, stakeholders, partnerships, role of public/ private sectors, social equity, BIPOC communities, etc.)





## SUMMARY OF WORKSHOPS

The transportation electrification transition necessitates addressing these issues and developing pathways for success in the transition. Meeting clean transportation goals is a key force influencing state-level efforts to electrify transportation.

States convey these clean transportation goals differently, and as a result, these approaches impact the adoption and deployment of electrified transportation. Furthering state-level transportation electrification goals ultimately requires a collaborative approach leveraging stakeholders and value-stacking benefits.

### Consumers & Social Equity in Transportation Electrification

The first workshop on *Consumers & Social Equity in Transportation Electrification*—held February 24, 2020, with concurrent breakout sessions—laid the foundation through a social equity and consumer lens to ensure that all consumers equitably share the benefits of transportation electrification.

Themes that emerged included the need for visibility and information sharing about existing EV charging locations so that all have access to the infrastructure that's already in place. But access is broader as well.

It's imperative that newly developed EV resources include ADA compliant infrastructure and community charging on side streets and in other areas—such as multi-unit housing—where access to home and public charging may be limited.

It's equally imperative to consider the needs of BIPOC communities in the planning process to ensure equity in access.

Our stakeholders also emphasized the necessity of community involvement in decisions about further development of electrification.



## Transportation Electrification Infrastructure - Technology, Installation and Ownership

The second workshop—*Transportation Electrification Infrastructure – Technology, Installation and Ownership*—convened on May 18 and June 15, 2020. These expert panels, followed by breakout sessions on June 22 - 26, 2020, expanded the foundation of knowledge and increased stakeholder engagement. The workshop sought to ascertain infrastructure challenges, opportunities and synergies for each of four use cases.

As a result of the interactions in this and the first workshop, it became apparent that clean transportation technologies are essential to achieving regional and local climate action plans, future state-level renewable energy, air quality and climate change goals as well as Environmental, Social and Governance (ESG) goals for corporate and private industries.

Our discussions also revealed that technologies alone are not enough. Leadership by stakeholders is key, and the state giving stakeholders the opportunity to lead will make a difference. Each stakeholder—auto manufacturers, utilities, municipalities, NGOs, independent EV charging site hosts, and others—brings unique knowledge to bear on transportation electrification. Let's give them a chance to lead our efforts as they work together to achieve the goals we've set.

They can contribute through provision of rebates, residential and commercial EV rates, charging infrastructure, incentives for infrastructure development, better utilization of vehicle-grid integration technologies to support shifting demand, and many other ways.





*In turn, these efforts will help corporations achieve their ESG goals.*

There is consensus that vendors, utilities and other market participants are looking to the State of Illinois—the governor, legislature, public utilities, ICC, and the Department of Commerce & Economic Opportunity (DCEO)—to take aggressive action while providing guidance on:

- Determining how much and what type of charging infrastructure is needed.
- Improving regional coordination around infrastructure corridors.
- Deciding who should invest in the charging infrastructure.
- Minimizing barriers to private investment in EV charging stations.
- Assuring all, including BIPOC communities, have equal access to it.
- Going beyond expectations to advance the electrification of transportation.

Tools exist to aid in this effort to ensure optimization of benefits with high utilization of physical assets and reasonable installation and operational costs. And, developed plans should not only incorporate these tools but also integrate the learnings from other states.



## Pilots, Programs & Partnerships for Transportation Electrification

Following these workshops, the next step was to identify synergies across stakeholders to advance electrification through potential pilots, programs and partnerships.

Aptly titled *Pilots, Programs & Partnerships for Transportation Electrification*, the third workshop took place on August 3, 2020, with virtual breakout sessions held during the week of August 17 - 20, 2020.

Outcomes from the workshop included promotion pilot programs and demonstration projects. These allow for partnerships across public and private sectors and provide opportunities to gain valuable insights through demonstrating and validating potential programs and by developing mutually beneficial and collaborative relationships.

*“Increasing the number of electric vehicles will make Illinois a healthier, cleaner, and more prosperous place to live. Local and regional economies will grow, jobs will be created, and it will improve the air quality and health for our citizens.”*

**—Illinois Clean Air Now (ICAN)**

In addition, a state-level TE plan encouraging collaboration across stakeholders would offer opportunities for exploring a range of possible use cases and business models for transportation electrification. Subsequent monitoring, collecting and reporting of data from such pilots, programs and partnerships could allow for the alignment of the state's transportation electrification goals with equitable distribution of services. When these align, the response to diverse consumer needs is more holistic.

Also, a state-level plan for transportation electrification needs to maintain safety with continued service, encourage utilities to capture value and efficiencies, and design rates to support consumer choice and grid management. It also needs to replace more demand-based rates with other cost-based solutions to help make EV fueling more cost competitive with fossil fuels. And it should prioritize the use of clean resources to optimize the grid so that we're using clean resources to generate clean power and further reduce carbon.

***Four use cases further highlight the needs and opportunities that lie ahead.***



# USE CASE 1

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## Residential and Multi-Unit Dwellings with and without Dedicated Parking

### Key Points: Residential and Multi-unit Dwellings

- **Consumer education and awareness** must be a top priority.
- We must **help our state embrace the EV future**. (Two-way awareness is key – Needs meet solutions. Educate on infrastructure as an asset and not a liability.)
- Enlist **Community Ambassadors**. To expand on engagement across communities and to advocate for EVs.
- **Keep the message simple**. Deploy infrastructure, educate consumers, allow participants to propose their own solutions and be a part of the future

1





### Facts:

- Most Illinoisans would prefer to charge their EVs at home, that is, in residential single (SF) or multifamily (MF) housing, with and without dedicated parking.
- These residents would need easily accessible charging at their homes, and in dense urban areas such as Chicago, that also equates to a need for public charging stations. Seventy percent of the city's residents live in multi-unit housing and own vehicles, making parking in areas of public right-of-way (ROW) a necessity.
- Other cities have similar charging challenges, and rural areas have unique needs as well.

### Obstacles:

In this use case, the obstacles to transportation electrification are many. Public infrastructure may be lacking, with easy access to charging stations nonexistent in many areas. Locating public DC fast charging at convenient locations (e.g., grocery stores, public parks, retail centers, etc.) may be needed, especially for those who live in multi-unit dwellings without access to charging, but grid impacts of fast charging need to be considered. Yet, installing the public infrastructure requires significant capital investment.

For those who do have access at home, the electric vehicle supply equipment (ESVE) is most likely Level 1 or Level 2, operating at 120 V and 240 V respectively, giving users up to 5 miles of range for Level 1 or 20 miles for Level 2 per hour of charging.<sup>5</sup>

Although this rate of charging could take users up to 20 hours to get a full charge from zero, most EVs do not return home with a fully depleted battery, so Level 1 and 2 charging rates are adequate for nightly recharging in single family dwellings.<sup>6</sup>

In multi-family dwellings that make up many of the urban and rural landscapes in our state, Level 2 charging is also sufficient for similar reasons as the single family use case, if the charging infrastructure is appropriately available for tenants. If appropriate Level 2 overnight charging is not available, access to DC fast charging for residents of those areas may be needed, but who should take responsibility for installing it? Is it the landlord, tenant or homeowners' association (HOA)? And who





pays the upfront costs? These are just some of the issues that become obstacles for multi-unit residential areas.

Then there's the investment required, not only for adding the infrastructure but also managing and maintaining it. This obstacle—the cost of developing EV infrastructure—is the single most challenging obstacle Illinois faces. It includes capital and operating expenditures, some of which rebates and/or “make-ready” approaches could help mitigate.

Some of those expenses involve retrofitting older buildings, which requires significant investment, as does upgrading larger buildings. All need adequate stations and the power capacity for charging multiple cars, which add to the price, as does the necessary maintenance of installed chargers, which demands ongoing investment in the infrastructure.

Finally, there is a strong need for consumer education and awareness. Lack of adequate consumer information touting the benefits of EVs is one of the most significant obstacles for transportation electrification, particularly in disadvantaged BIPOC and other communities.

### Opportunities:

Wherever obstacles exist, opportunities also present themselves. Such is the case for the electrification of transportation in residential areas; after all, everyone has electricity in their homes.

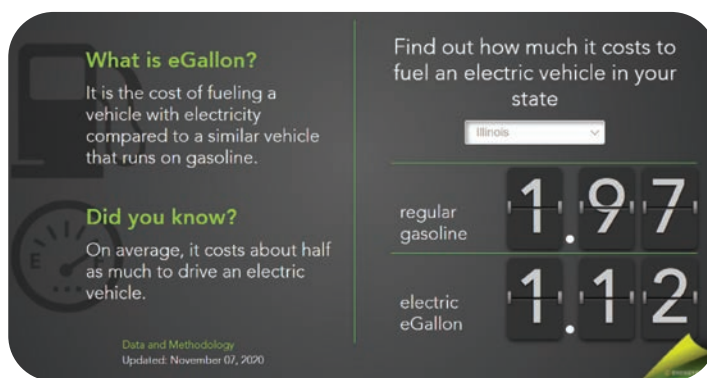
Depending on power mix in a region, plugging in when generation is in excess is more cost effective for consumers, and this approach benefits the grid as well (i.e., In Illinois, plugging in overnight is cheaper because excess electric generation occurs during the overnight hours. In other regions, the excess may take place in the middle of the day). The opportunity to benefit both the public and the electric grid is worthwhile.

Smart charging is another opportunity that has wide benefits. Managed charging helps consumers plug in at the most cost effective times. Education and awareness about smart charging, rates, and other best practices of EV ownership will help the public know the what's, when's, and how's of EV ownership. Increased knowledge will help them make smart decisions about when and where to charge for the most cost-effective opportunities.



Every driver knows, for example, the average cost of a gallon of gas where they live. In Illinois in November, 2020, that's \$1.97. Many don't know the cost to fuel an EV, however. An electric eGallon (or gasoline gallon equivalent) is \$1.12 **in Illinois in November, 2020**. Stakeholders including utilities, nonprofits, NGOs, EVSPs and others, can provide valuable information to the consumer, such as an **online EV toolkit** that demonstrates to consumers the potential savings for driving EV's. Education and awareness are keys to helping consumers embrace the developing EV industry and understand how to maximize the benefits available to them.

### **eGallon: Compare the costs of driving with electricity**



source: [energy.gov/maps/egallon](https://energy.gov/maps/egallon)

Another opportunity to aid the development of EV charging infrastructure is including it in the construction of new homes. Builders can easily incorporate it without a higher consumer price tag; and again, education and awareness are keys to making progress in this area. It should be noted that greater access to plug-in capabilities that simplify at-home charging could encourage non-EV owners to move toward EV ownership.



The City of Chicago has taken steps in this direction. On November 1, 2020, the [Electric Vehicle Supply Equipment-Ready, or ESVE-Ready, ordinance](#) went into effect. Updating Chicago's municipal code, the ordinance mandates at least 20 percent of parking spaces be reserved for EVs when new residential construction consists of at least five units. For new commercial properties, twenty percent should be reserved for locations with 30 or more parking spaces on site.<sup>7</sup>

Other opportunities exist if we think long-term, especially the chance for partnerships. Building associations, homeowners' associations, building code developers, utility companies, electric vehicle service providers, car dealerships and more have potential for bridging gaps in education, awareness, affordability and access.

Reaching out to these and other stakeholders could contribute to identifying, reducing and removing barriers that have stood in the way. Emphasizing the value -- better air quality, healthier communities--rather than focusing solely on cost could also aid in communication with consumers.



## USE CASE 2

### Workplace, Community and Destination Charging

#### Key Points:

#### Workplace, Community and Destination Charging

- **Incentivize transition** to EVs with financial stimuli to ensure equity and availability for the workplace and community.
- **Keep an eye on the end goal** of transportation electrification, and let's learn as we go.
- **Demonstrate a unified approach from leadership**—state and local governments – on urgency of the transition to EVs.
- **Remember we are just getting started.**

2







### Facts:

Workplace, community and destination charging can make the transition to EVs easier, as long as the stations are reliable, easy to find, and adequate to meet consumers' needs.

Workplace charging provides access to employees where they work; community charging infrastructure is publicly available at gas stations, public parking lots, and other community wide locations; destination charging describes plug-in capabilities at destinations such as shopping centers, tourist attractions, hotels, and restaurants.

Similar to destination charging is corridor charging. **Corridor charging** is "a national network of alternative fueling and charging infrastructure" the US Department of Transportation Federal Highway Administration (FHWA) has set up along the corridors of our national highway system for convenience to travelers.<sup>8</sup> It's accessible along major thoroughfares such as 290 and I-55.

Because these streams—workplaces, communities, and destinations—have widely divergent needs and reasons for installing charging infrastructure, understanding the specifics of each one is imperative when planning the development of the infrastructure.

A hotel owner, for example, is leveraging access to an amenity while workplaces use it to attract clients and colleagues. Corporations have an opportunity to meet ESG goals when they offer access to EV charging stations. Public and private investors can help meet consumer needs and contribute to a better future when they invest in publicly-owned infrastructure.



## Obstacles:

One of the primary obstacles is the challenge of meeting the unique needs of consumers whether they are in their local communities, at work, or on family vacation. EV owners should have one reliable, accessible place to charge on most days.

Motivating hotel owners and employers to invest in charging infrastructure that meets this need of their clients and employees may be less challenging because the benefits for their constituents are easy to see. But the urgent need for publicly-owned infrastructure requires public and private investment, which may be harder to come by.

Distinguishing and meeting the unique needs of consumers isn't the only challenge. Cost is often a factor, and that's no exception here. The initial cost of Level 1 and 2 charging stations to owners—whether that's the franchisee at a hotel or the CEO of a local company who employs a number of area residents – can hinder interest. Ongoing maintenance and other costs (i.e., monthly network fees) associated with charging infrastructure can also hold them back. This is why policy solutions such as rate designs, infrastructure rebates, or utility direct investment or “make-ready” are important.

It's important to note that third parties such as ElectrifyAmerica Technology, EVgo, or Tesla take on the costs for DC fast charging (DCFC) stations, so the amount of required investment isn't as significant a barrier for those as for Level 2 charging that companies may install on private property.



It is also important that property owners understand the amenity value the station provides and approach the process more from a cost-benefit analysis using a holistic approach.

Often visibility and access is not the first and foremost consideration when deciding where to place EVSE, but both should be a top priority. It may be cheaper and easier to place a charging station on the back corner of a lot just behind the dumpster, for example, but doing so further limits access.

The question many are asking is how we can identify the cost-benefit recovery. Will consumers use charging stations just because they're built? How do we evaluate the equity, sustainability, health benefits provided by access to EV charging? And can we keep it affordable for easy access by all?

These and other questions remain challenges the industry faces. And a huge risk remains if we don't build pilot programs to test our work and guide the pace of development.

### **Opportunities:**

Opportunities abound in the workplace as we move to prioritize EV use. Incentives for vehicles and infrastructure – in the form of state tax credits, rebates, and other programs – could encourage employers and employees alike to buy in.

Employers also have the added opportunity of shaping workplace policies in these early stages of transition away from internal combustion engines (ICE) toward EVs. As they shape workplace policies, they can also take further steps toward achieving their ESG goals.

Another workplace opportunity is the potential for managed charging to help employees plug in at the most cost effective times, again benefitting both the individuals and the electric grid.



Opportunities also exist to provide incentives for utilities to encourage the deployment of infrastructure through direct investment programs, [make-ready programs](#) or EV rate designs. The utilities' contribution toward customer EV use has potential to increase EV market share, value and revenue which can be reinvested in EV programs, and can ensure that EV owners in all communities, including rural, have access to the charging infrastructure which they need. Also, offering incentives for infrastructure development could encourage adoption of EV friendly policies and programs.

Publicly owned facilities also have tremendous opportunity to shape the public's interaction with EVSE in public ROWs. They can contribute to greater social equity with decisions that allow expanded access in BIPOC communities and others. For example, installing EV charging stations in school parking lots could allow teacher and staff access during the day and neighborhood access at night and on weekends.

Municipalities, too, can contribute by adopting zoning codes and permitting processes that expedite investment in EVSE, and city councils have the chance to expand access when they prioritize the use of public funding to invest in electric fleets and public charging infrastructure.

Public and private stakeholders can choose from among many opportunities to truly contribute to a better world by investing in the transition to EV. Incentives from the [Volkswagen Settlement](#)<sup>9</sup> and a [2019 Illinois capital plan-infrastructure initiative](#) are already available to the state to build infrastructure. The capital plan authorized \$70 million for transportation electrification.<sup>10</sup>

***The State of Illinois is ripe with opportunity.***





## USE CASE 3

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### Public DC Fast Charging Infrastructure for Specific Use Cases (i.e., TNCs, corridors, long-distance, captive fleets)

3

#### Key Points: Public DC Fast Charging Infrastructure

- Education is power.
- The need is urgent.
- Incentives are critical.
- **Act now** to deploy charging stations and adjust as we go.
- **Keep it simple.**
- **Partner and coordinate** with as many stakeholders as possible.
- Municipalities should **focus on feasibility studies.**
- Cities, utilities, and the state should be **collaborating on a statewide plan with consideration for regional coordination.**





### **Facts:**

As compared to Level 1 and Level 2 charging, DC fast charging infrastructure (DCFC) has higher costs, both in equipment and in demand-based rate structures. Funding sources such as the Volkswagen Settlement and the Capital Plan can help to mitigate some of these costs, and utilities can play an important role in reducing operating costs through tariff reform.

In Illinois, the upfront initial investment in DC fast charging stations can be as high as \$35,000 for the equipment only, with location and installation costs (e.g., engineer/design, permitting, construction) as additional. Although the initial investment to implement it is high, over time as utilization increases, the costs will be recovered; and it's important for planners to keep this in mind. DCFC is a high-cost new technology that'll pay off in time.

DCFC is often thought of as a corridor opportunity to help EV drivers on long distance trips. However, it's also an important urban use case, as apartment dwellers and those without access to home or on-site charging may rely on public DCFC at grocery stores and other retail centers for the majority of their charging needs. Local providers can leverage data that shows where customers are and match those needs with available charging units.

Generally speaking, public DCFC is split between local needs (e.g., about town) and long-distance trips (e.g., low utilization followed by significant need on weekends and holidays). This isn't as much a "cost" issue but a utilization risk. Station operators want to build a station after they know the demand is there while automakers, customers and policy makers often want the stations before. It's important to offer grants, incentives and support that can offset the low utilization as EV ownership ramps up.



It's also necessary for planners to remember that awareness and access lead to adoption. With DC fast-charging infrastructure often hidden from view, the public may or may not know where charging stations are. Publicly visible EV charging infrastructure, however, sends a clear signal to the public about access and drives adoption. As more DCFC is built, consumer confidence will continue to increase as charging infrastructure becomes more prominent, allowing "range anxiety" to decrease.

Airports such as O'Hare and Midway provide specific examples of locations where greater access can lead to further electrification—of buses, TNCs, rental cars, rideshares, taxis, shuttles, and more. For example, **LYFT has promised** a move to all electric vehicles by 2030.<sup>11</sup> With more and more airports taking advantage of the EV opportunity and investing in the necessary charging infrastructure, other TNCs may follow suit. Though the **cost to retrofit an airport** for electric transportation is high, the potential for recovering the cost is equally so, making airports a unique location that can promote transportation electrification.<sup>12</sup>

Is cost a significant upfront barrier to DCFC? Yes, but it's one that can be overcome through rebate programs, rate reform, and other measures. Addressing the cost barrier is a step toward greater equity and more long-term community benefits—decreased pollution, increased air quality, improvement in health and wellbeing.

***"For airports, installing electric vehicle charging stations [including DC fast-chargers] stands to provide a number of benefits (if done right). Since parking serves as the largest non-airline revenue source, attracting EV owners offers the opportunity of increasing lot occupancy and providing a value-added parking product. By assessing how each lot is used, airports can determine which level of charging station would be best utilized and can establish a monetization model that best serves its organizational interests."***

**—Green Ways 2 Go**



### Obstacles:

As stated above, one of the biggest obstacles for public DCFC is the high upfront capital expenditure. Although costs have come down substantially over the past several years, our stakeholders agreed that costs would continue to decline. For now, the [US Department of Energy](#) notes the approximate costs for equipment only as: a single port EVSE Level 1 station costs \$300-\$1500; a Level 2 costs \$400-\$6500; a 50 kW DC fast charging station goes for \$25,000-\$35,000; and higher-powered chargers at 150 kW or 350 kW that are being deployed now to match the larger battery capacities, the cost is higher, more than double the 50 kW number.<sup>13</sup>

As mentioned earlier, there are many other costs associated with siting and building a DCFC station, including permitting, possible trenching, engineering, and design. These additional costs are very site-specific. Generally, DCFC EVSE cost if about one-third of the total cost. So, for example, if there is not much additional work in preparing the site for DCFC station, the total cost might be in the \$90K to \$100K range.

The cost of the chargers is just the start of the investment; and at low utilization, the fast chargers also present a challenging business case for those who want to own, operate and maintain them, which is why rate reform is critical.

### Other challenges facing public DCFC infrastructure include issues with location and visibility:

- ROW disputes
- Questions of the best location for the stations—considering the amount of electricity needed, trenching required, and utility interconnection demanded
- Need for 24-hour access, which further limits location and design
- Lack of visibility which leads to lack of awareness. While gas stations generally have adequate signage to point the public to their location, for example, charging stations typically have very little. Without signage, consumers may not be aware where they can plug in to recharge.



Also, demand charges can drive the price per kWh well above the cost of gasoline, a disincentive for EV drivers and a cost DCFC operators typically do not pass on to their customers, making the ongoing operation of the station financially challenging.

Rate design is also an increasing concern as usage ramps up, and the need for options and flexibility is important as well. Utilities can help by filing commercial EV rates, as well as making capacity maps available to help guide development for third party operators.

Then there's the "Tesla and everyone else" problem. PlugShare says, "There are more than **260 DC fast charging stations** in the Chicago metro area, 154 of which are Tesla Superchargers as of March 2020."<sup>14</sup> Non-Tesla drivers face this obstacle on the road every day. DCFC stations utilizing CHAdeMO and the Society of Automotive Engineers (SAE) Combined Charging Systems (CCS) standard are needed.

This is why Illinois must move quickly to implement the Volkswagen Settlement funding, as well as the Capital Bill funding to encourage a truly statewide charging network, including opportunities for urban dwellers without access to home charging.



### Opportunities:

Many investors are moving toward sustainable energy resources rather than fossil fuels, and this gives us a great opportunity for change. Some of the opportunities in front of us include the chance to model the availability of resources and raise consumer awareness. Several models are possible:

- With utility companies, show EVs as the new best thing and engage customers on the benefits EVs offer while encouraging EV friendly tariff designs.
- With auto manufacturers, nurture relationships with drivers and the retail market to help build desire for EVs.

With convenience stores, retail centers, and other consumer facing businesses, provide opportunities to showcase the advantages of EVs and the ease of use when charging stations are available.

Building in hubs—4-6+ units/plug per site—offers the necessary protection against stations not working, ensures accessibility for customers, and avoids long lines.

Also, the opportunity to develop new capacity maps that identify grid constraints will help guide **more efficient siting of EVSE**.<sup>15</sup> In turn, EV charging stations will maximize the impact to communities and make use of collaborative expertise from universities, labs, and others in local regions. Using the corridor approach and collaborating across state lines could also multiply the impact.

Policy and regulatory conversations can provide the framework to encourage the deployment of DC fast charging stations and increase availability in rural areas.

Supporting fast charging that all drivers can use—Combined Charging Systems (CCS) and CHAdeMO -- addresses the “Tesla and everyone else” problem. The SAE CCS standard that every other OEM has agreed to use moving forward is an opportunity to grow DCFC. With an adapter, Tesla owners also have access to these systems, increasing accessibility for all EV drivers.





Currently, there is a lack of public charging where many drivers for transportation network companies (TNCs) such as Uber and Lyft live. Increased investment in urban fast-charging infrastructure could help those drivers make a fairer transition to EVs and deliver outsized environmental benefits.

When higher-utilization drivers can shift to electric vehicles - including drivers on TNC apps, taxi drivers, and other commercial transportation service providers—communities can realize 3-4 times greater emissions savings compared to average car owners.<sup>16, 17</sup>

Additionally, initial industry findings show that EVs in rideshare applications can provide grid benefits and potentially increase renewable energy consumption.<sup>18</sup> Shared mobility platforms can also increase citizens' exposure to EVs and all business models should be considered when discussing incentives and programs designed to offset the costs of EV station construction.

In September 2020, Uber released its Climate Impact and Performance Report showing that a battery EV driver on its platform in the US and Canada serves an average of 100 active riders per month.<sup>19</sup> With that many riders having access to electric transportation, public awareness will continue to increase.



## USE CASE 4

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Medium- to Heavy-Duty Vehicles  
(i.e., Transit Agencies, school buses, Proterra, Amazon, FedEx, UPS, etc.)

4

### Key Points: Medium to Heavy-Duty Vehicles

- Be sure we're **paying attention to end users and their needs**.
- **Stay aware** of the leading edge in this use case, our peers, and others.
- **Establish electric fleets** that pay for infrastructure.
- **Pay attention to the complexities** of the commercial trucking versus freight.
- **Address down time.**
- **Keep public safety top of mind** when considering where TE makes sense.





### Facts:

Electrification of medium- and heavy-duty vehicles provides the potential for significant impact on decarbonization and reduction of air pollution with benefits for communities that are challenged with commercial and industrial footprints near residential housing.

*“In May 2016, the National Renewable Energy Laboratory tallied at least 22 U.S. airports with significant eGSE projects. The largest projects were at SeaTac, Philadelphia, and Dallas Fort Worth, where between 230 and 430 eGSE were being used at each airport.”*

—National Renewable Energy Laboratory

Each specific use case within the broader category has its own uniqueness, and we must consider that when planning. TNCs like Uber and Lyft, taxis, rental cars and other airport users, for example, differ from box trucks making local deliveries or carrying cargo long distances and school buses making frequent stops along a rural route.

Airports have unique fleets as well, and they are increasingly incorporating electric Ground Support Equipment (eGSE) into them. GSEs are the vehicles that service airplanes, refuel them, transport passengers, and more.

Striking differences exist for urban and rural users as well. Transit agencies typically provide greater access to public services in urban areas than rural; and rural residents often need their own vehicles while facing longer drive times to work and the nearest towns.<sup>20</sup>



**Other examples of the very different infrastructure challenges for each specific use case include the following:**

- Amazon and UPS are a much different infrastructure problem than heavy-duty applications which are different from other fleets. Amazon and UPS are more about building suitable hubs and having quick, large service upgrades. A more limited need for incentives exists in this part of the market.
- Fleets vary in use cases, so solutions for small depots and installing home charging at employees' homes are likely to be an important near-term use case for fleets to address immediate needs and accelerate the market. Longer term solutions will be needed to solving complexity and finding financing approaches.
- Heavy duty EVs are certainly not as well-developed, and a lot of the existing language in the section applies more to this realm as technology develops.
- In all cases, large electrical service needs will mean a big role for the utility.

Owners of multiple light-, medium- and heavy-duty vehicles stand to benefit from easily accessible charging infrastructure. Whether passenger vehicles residents use to travel to and from work, the grocery store, or a family member's home or heavy-duty delivery vehicles carrying long-haul loads, all can integrate transportation electrification more readily into their routines when the infrastructure is in place.

It's important to recognize the uniqueness of each specific use case; however, for our purposes, we'll focus on the broader category since so many medium- to heavy-duty vehicles travel on Illinois roads.



### **Obstacles:**

Lack of availability of EV charging for these heavier vehicles is a primary concern, and we cannot simply plan to install chargers without considering the cost of installation for ESVE that would adequately meet the load requirements of vehicles in these categories and recognize the need for “up-time” for mission readiness.

The underrepresentation of this use case—with no sufficient models—presents the need for largely start-from-scratch holistic planning to coordinate building adequate EV infrastructure that meets the needs of medium- and heavy-duty fleets.

For starters, because the vehicles are large, their flow in and out of designated lots for charging purposes presents one of many practical challenges. Especially in areas where large fleets congregate, substantial loading on substation and distribution assets also presents a practical challenge, and floorspace for all the major charging infrastructure is also an issue. Extensive time is needed for planning and development of medium- and heavy-duty vehicle electrification and should be well managed.

For the moment, little is known about what it would actually take to address these challenges, and experts suggest later phases of installation are even more complicated than the initial phase.

Questions have continually arisen: Who'll pay for the infrastructure? How will they manage the interoperability of non-compatible plugs and other functional dilemmas? How will rates be designed to alleviate the economic barrier of underutilization?





## Opportunities:

For all the challenges facing this segment, however, opportunities also abound.

First and foremost, the total cost of ownership for many fleet vehicles is already lower than their comparable non-electric counterparts. This is due to a combination of factors including lower fuel costs and significant maintenance and repair savings over the life of the vehicles. Because fleet managers are heavily focused on the bottom line, this sector presents an immediate and near-term opportunity to advance electrification.

*“FERC Order No. 2222 will help usher in the electric grid of the future and promote competition in electric markets by removing the barriers preventing distributed energy resources (DERs) from competing on a level playing field in the organized capacity, energy and ancillary services markets run by regional grid operators.”*

—Federal Energy Regulatory Commission

Real-time opportunities also exist in the chance for fleet owners and utilities to combine managed charging software with load to reduce costs, and for the private sector to help fleet owners reduce overall costs. Allowing commercial EV rates to help mitigate demand charges for both public charging and fleet providers is another opportunity. Finally, fleet managers can often realize additional savings by thinking holistically how to optimize their fleet's operations, vehicle schedules, delivery routes and fueling (or charging) profiles, and this can be achieved through leveraging vehicle connectivity and capability (e.g., telematics).





New regulations are also opening new opportunities. In March, 2020, the City of Chicago published the Chicago Commercial Electric Vehicle Readiness Guidelines.<sup>21</sup> In June, 2020, the California Air Resources Board (CARB) adopted a regulation mandating manufacturers of medium- and heavy-duty vehicles to transition to zero-emission electric trucks, and legislation modeled after California's plan is pending in Illinois.<sup>22</sup> In November, 2020, the Electrification Coalition published a white paper outlining the challenges and opportunities for electrifying the freight industry in the US.<sup>23</sup>

***“Today California, Connecticut, Maine, Massachusetts, New Jersey, Oregon, Rhode Island and Vermont committed to move forward together to develop an agreement and action plan to put hundreds of thousands more zero-emission trucks and buses onto their roads and highways. The Statement of Intent announced today is intended to support accelerated deployment of medium- and heavy-duty zero emission trucks and buses.”***

**—Northeast States for Coordinated Air Use Management (NESCAUM),**  
December, 2019



The bus industry presents a significant opportunity as well, with vehicle-to-grid integration a notable benefit of electric school buses. According to CleanTechnica, the biggest fleet of commercial vehicles in the US is the nation's school buses. With buses in use just a few hours per day, their batteries could make significant contributions to the electric grid while they're not otherwise in use.<sup>24</sup>

Local and municipal incentives for deploying infrastructure also help drive interest and buy in, and training that improves workforce development can advance the job market.

The vast need and opportunity for start-from-scratch infrastructure offers an incredible chance to set a strong foundation and create a model for others to follow. The model can include education and outreach, infrastructure deployment incentives, and planning.

With the Driving a Cleaner Illinois Program—a grant program the Illinois EPA developed to distribute funding to reduce diesel emissions—and EVs in the state's capital budget, we're off to a good start!<sup>25</sup>



## KEY POINTS FOR ALL

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As we come away from the discussions, some key points stand out, giving us tools for guidance as we press forward.

It's clear that transportation electrification is beneficial to individuals and communities. It contributes to better air quality, overall health, reduction of carbon emissions and so much more.

***Yet, the cost of EV infrastructure is a significant barrier. With both capital expenditures and operating expenditures to consider, it's by far the biggest challenge we face in moving toward EVs in our state.***

Addressing the cost barrier can ensure equity and cost recovery at once, and it's imperative that we do so, creating affordable solutions to mitigate this challenge and open the door to greater access among BIPOC communities and more.





**Addressing the cost barrier and other challenges will take all of us working together. Keys to our success will be:**

➤ **Planning.**

The need is urgent, and a clear running theme in our discussions was the urgency to act now. But not without planning. A coordinated plan that takes into consideration the needs, obstacles and opportunities of each use case is the best approach. So, while we don't want to wait to take action, we do want to start with a solid plan.

➤ **Collaboration.**

A solid plan requires the input of all stakeholders. This fact brings collaboration to the forefront as a necessary starting point. Collaborate. Partner. Share information. And engage the community residents for early buy-in. Let's start there...

➤ **Flexibility.**

And be willing to flex. We're in the early stages of an incredible transition that will make our world a better place. All of our collaborative efforts won't be successful, but that's no reason to give up. Instead, we can be flexible as we try new things and pivot when necessary. Flexibility will be a key to our success.

➤ **Funding.**

While the economic incentive to drive electric already exists today, many of the barriers we have addressed such as the lack of charging infrastructure require additional funding. Leveraging electric utilities and other resources is critical to overcome these early-stage financial barriers to infrastructure deployment. One possibility is reexamining existing funding programs to ensure that new and innovative business models like self-driving ridesharing fleets are eligible. Another option is using managed charging to move the electric load to off-peak hours, so we can take advantage of slack in the grid to create more revenue for utilities that can then go to further grid modernization. Doing so provides system-wide benefits and not just benefits to EV owners.





### 👉 Education.

Finally, we cannot overstate the need for education and awareness. The public and other potential end users need to understand what's in it for them, and policy makers need to be willing to listen to what communities want from E-mobility. Utilities, manufacturers, municipalities, and other stakeholders also need a greater awareness of the role they can play in improving the air quality and health of all Illinoisans.

Overall, transportation electrification is a unique opportunity to provide a proactive, innovative and sustainable solution impacting climate change, fossil fuel usage, community and economic development, and efficiency. It has the potential to create manufacturing and supply chain jobs, increase involvement in trades, open opportunities for BIPOC communities, reduce sick days taken from school and work, and so much more.

***With these things in mind, it is imperative for the State of Illinois to develop and deliver a plan for transportation electrification in our state. We can begin immediately with policies that put more EVs on Illinois highways, rate reform that counters high demand charges, deliberate use of the funds the state has already allocated, and an Electric Fuels Standard that sets the bar high.***







## APPENDIX

### UIC WORKSHOPS ON BENEFICIAL ELECTRIFICATION OF TRANSPORTATION

Dr. Elizabeth Kócs, UIC Energy Initiative

#### Consumers & Social Equity February 24, 2020

- **Philip Jones**, Alliance for Transportation Electrification
- **Angela Tin**, American Lung Association
- **Susan Mudd**, ELPC
- **Dave Kolata**, Citizens Utility Board
- **Tom Ashley**, Greenlots

#### Infrastructure: Technology, Installation & Ownership May 18 and June 15, 2020

##### UTILITY PERSPECTIVES PROGRAM

- **Michael Abba**, Ameren Illinois
- **Philip Roy**, ComEd
- **Andrew Lewis**, MidAmerican

##### CUSTOMER PERSPECTIVES PROGRAM

- **Christopher Schmidt**, IDOT
- **Edith Makra**, Metropolitan Mayors Caucus
- **Megha Lakhchaura**, EVBox

##### NATIONAL & INDUSTRY PERSPECTIVES,

- **Dan Bowermaster**, EPRI
- **Alex Keros**, General Motors
- **Thomas Wallner**, Argonne National Lab
- **Kevin Miller**, ChargePoint

##### OPENING REMARKS

- **Terry Travis**, EVNoire

#### Pilots, Programs & Partnerships August 3, 2020

##### ELECTRIFYING LIGHT DUTY VEHICLES

- **Sara Rafalson**, EVGo
- **Prashanthi Raman**, Cruise
- **Adam Gromis**, Uber

##### MEDIUM DUTY & HEAVY DUTY VEHICLES

- **Samantha Bingham**, CDOT
- **Josh Cohen**, Greenlots
- **Alan Westenskow**, Proterra

##### CLOSING REMARKS

- **Commissioner Maria S. Bocanegra**, ICC



## ENDNOTES

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A special thank you is extended to the many reviewers from the workshops who provided invaluable input.

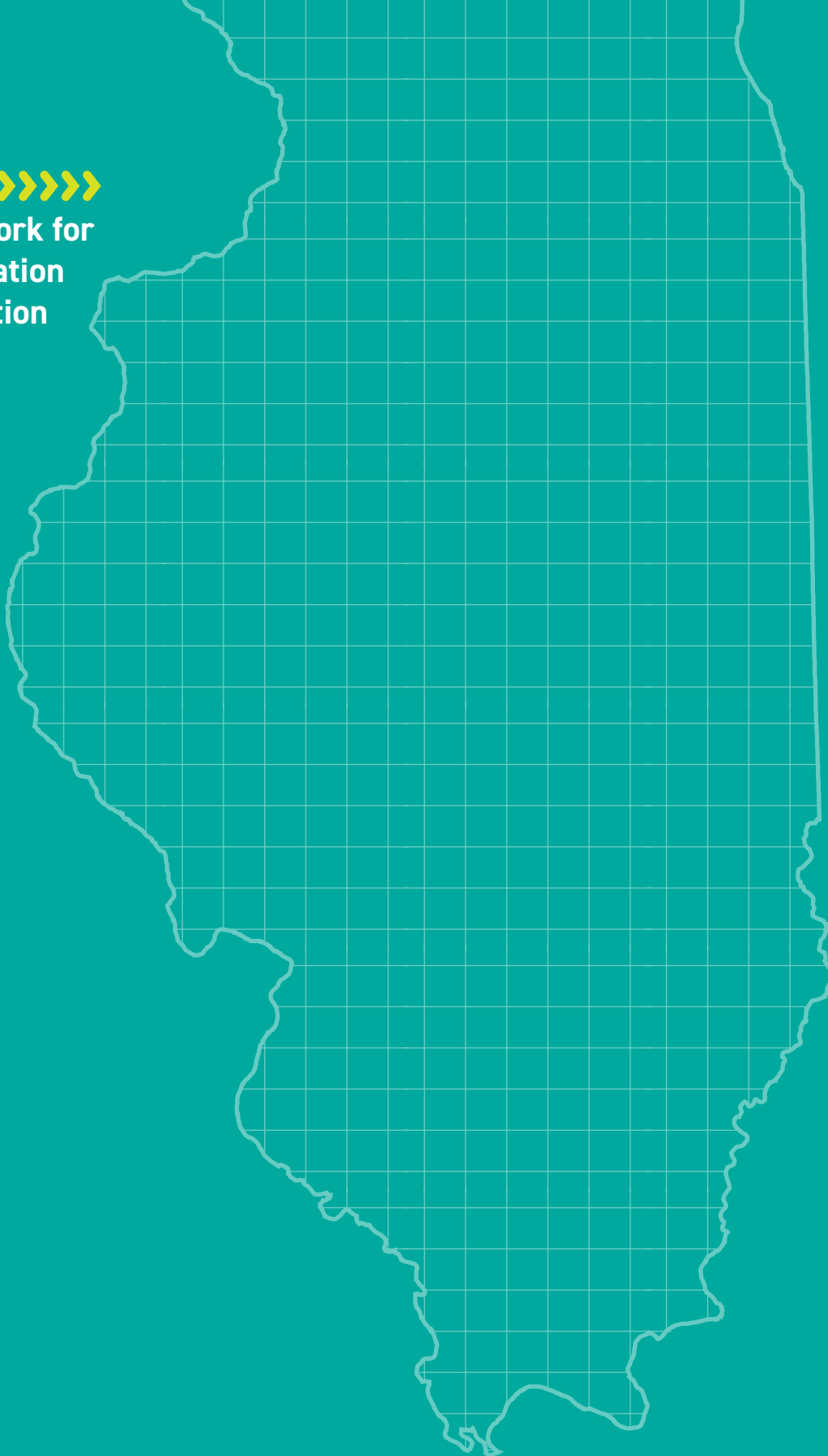
Thanks are due as well to the many partners and stakeholders for their valuable contributions during the workshops, including EV advocates, EVSE manufacturers and providers, utilities, automakers, universities, national laboratories, and many others.

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# A Framework for Transportation Electrification in Illinois



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